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Journal of the Society of Arts.

FRIDAY, NOVEMBER 6, 1868.

Announcements by the Council.

NOTICE TO MEMBERS.

The One-Hundred-and-Fifteenth Session of the Society will commence on MONDAY,* the 23rd NOVEMBER inst., when the Opening Address will be delivered by Lord HENRY G. LENNOX, M.P., Chairman of the Council.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock :—

1868.	November	—	—	23*	25	
,,	December	2	9	16	23	—
1869.	January	—	—	20	27	
,,	February	3	10	17	24	
,,	March............	3	10	17	—	31
,,	April	7	14	21	28	
,,	May..............	5	12	19	26	
,,	June	—	—	—	—	30†

For the Meetings previous to Christmas, the following arrangements have been made :—

NOVEMBER 23.—Monday.—Opening Address by Lord HENRY G. LENNOX, M.P., Chairman of the Council.

NOVEMBER 25.—" A Glance at the Past and Present of the Society of Arts, with some Suggestions as to the Future." By S. T. DAVENPORT, Esq., Financial Officer of the Society.

DECEMBER 2.—" Further Notes on the Productive Industries of Natal." By Dr. MANN, Superintendent of Education and Special Commissioner for the Colony.

DECEMBER 9.—" On the Theory of Boiling, in connection with some Processes in the Useful Arts." By CHAS. TOMLINSON, Esq., F.R.S., F.C.S.

DECEMBER 16.—" On Artificial Freezing." By Dr. B. H. PAUL.

DECEMBER 23.—" Description of the Electric Organ." By HENRY BRYCESON, Esq.

A book of blank Tickets of Admission to the Meetings is now being sent to each Member, who is privileged to introduce two friends to each Meeting on their presenting orders signed by him. Additional Tickets will be forwarded on application.

The first Course of Cantor Lectures for the ensuing Session will be " On the Aniline or Coal Tar Colours," by W. H. PERKIN, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday Evenings, the 7th, 14th, and 21st December, at Eight o'clock. Other courses are being arranged, particulars of which will appear in the *Journal.* These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded in due course.

Members are reminded that, should any of their friends wish to join the Society, the opening of the Session is a favourable opportunity for proposing them.

INSTITUTIONS.

The following Institutions have been received into Union since the last announcement:—

London, South London Working Men's College, Collingwood-street, S.E.
Newcastle-upon-Tyne, Mechanics' Institution.
Riddings (near Alfreton), Mutual Improvement Association.
St. Martin's (Stamford), Evening School of Art.

PRIZES FOR ART-WORKMEN.*

The Council of the Society of Arts hereby offer Prizes for Art-Workmanship, according to the following conditions :—

I. The works to be executed will be the property of the producers, but will be retained for exhibition, in London and elsewhere, for such length of time as the Council may think desirable.

II. The exhibitors are required to state in each case the price at which their works may be sold, or, if sold previously to exhibition, at what price they would be willing to produce a copy.

III. The awards in each class will be made, and the sums specified in each class will be paid, provided the works be considered of sufficient merit to deserve the payment; and, further, in cases of extraordinary merit, additional awards will be given, accompanied with the medal of the Society.

IV. Before the award of prizes is confirmed the candidates must be prepared, if called upon, to execute some piece of work sufficient to satisfy the Council of their competency.

V. *Bonâ-fide* Art-workmen only can receive prizes; and medals may be substituted for money prizes of equivalent value at the option of any successful competitor.

VI. Although great care will be taken of articles sent for exhibition, the Council will not be responsible for any accident or damage of any kind occurring at any time.

VII. Prices may be attached to articles exhibited and sales made, and no charge will be made in respect of any such sales.

VIII. All the prizes are open to male and female competitors on equal terms; and, in addition, *special* prizes, on the same scale as to amounts, will be awarded, at the discretion of the judges, among female competitors; although the specimens exhibited by females may not be as good as those exhibited by males, not deemed worthy of reward.

IX. Any producer will be at liberty to exhibit, either in his own name or through his workmen, any work or works as specimens of good workmanship, in the various classes, provided that the work or works be accompanied with a statement of the name or names of the artisans who executed their respective portions; and if the work or works be sufficiently meritorious, extra prizes will be given to the artisans who have executed them.

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* As the Elections render it impossible for the Chairman of the Council to attend on the 18th inst., the Opening Meeting is unavoidably postponed to Monday, the 23rd of November.

† The Annual General Meeting: the Chair will be taken at Four o'clock. No Visitors are admitted to this Meeting.

* The Worshipful Company of Salters contribute ten guineas annually to this prize fund. The North London Exhibition prize consists of the interest of £167 7s. 3d., invested in the name of the Society of Arts, to be awarded by the Council "for the best specimens of skilled workmanship" at the Society's Exhibition of the works sent in for the prizes named above.

X. Artisans may, if they think fit, exhibit works executed by them of a similar character to the prescribed subjects, although not exactly correspondent therewith. If the works be sufficiently meritorious extra prizes will be awarded.

XI. All articles for competition must be sent in to the Society's house on or before Saturday, the 19th of December, 1868, and must be delivered free of all charges. Each work sent in competition for a prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman. With the articles a description for insertion in the catalogue should be sent. The works will be exhibited at the Society's House, and afterwards at the South Kensington Museum.

XII. Two or more Art-workmen may concur in the production of any article sent in for competition; but in that case the names of, and respective parts taken by, each must be specified when the article is sent in, together with a statement of the proportions in which they may have agreed, if successful, to divide any prize which may be awarded.

⁂ The Council are happy to announce that many of the works which received first prizes in the competitions of 1863, 1864, 1865, 1866, 1867, and 1868 have been purchased by the Department of Science and Art, to be exhibited in the South Kensington Museum and the Art Schools in the United Kingdom.

The Council of the Society of Arts, in framing the above conditions and preparing the subjoined detailed list of subjects for competition, have had under consideration the recommendations of the Society's judges, as set forth in their last report, together with the opinion expressed by the Art-workmen assembled on the occasion of the announcement of awards made in connection with the last competition.

The principles upon which their programmes for the last six years have been based, namely, using the competition as a means of testing the power of the Art-workman of the present day to re-produce choice models of ancient art-industries, are believed to have worked most successfully; and the Council are of opinion that, however fitting it may be at the present time to remodel their programme, it will be well to return, from year to year, or from time to time, to the programme which has proved so useful in the past. Instead of making partial changes in that programme, they have deemed it best to offer one of entire novelty, having for its special objects—Firstly, To encourage the revival of the practice of dormant or rarely used processes of handicraft, by which the field of Art-industry may be extended, and Art-workmen thereby be, in course of time, more adequately remunerated as a class; and, secondly, to exercise the artisan in the practical application, in accordance with recognised principles of good taste, of the art-processes so to be revived, to objects of ordinary use, hitherto for the most part undecorated.

In considering the apportionment of the money prizes to the respective subjects, attention has been paid to the probable expense to which any Art-workman must be put in each case who may enter upon the competition.

It will be observed that in the First Division, " Specimens of Art-workmanship in prescribed processes," the money prizes are in all cases of smaller amount than in the Second Division, " Specimens of the application to ordinary industry of prescribed Art-processes."

The reason for this difference consists in the fact that the Council look for minor specimens in the one case, involving the workman in little expense beyond the risk of the loss of his own time; against which he should set the value of the improvement he may derive from making the effort under any circumstances; while in the other they expect to see a finished article of a more elaborate nature fit for immediate use by any purchaser.

Art-workmen are earnestly recommended to pay due regard to simplicity and harmony, as well as richness and elaboration, in all their productions, since the judges will estimate no less highly purity of line and good balance of colour or of plain and enriched surfaces, than they will any merits of mechanical execution.

The taste exercised in the selection of objects for ornamentation will be considered in the adjudication of the prizes.

First Division.—Specimens of Art-workmanship in Prescribed Processes.

For the best specimen of:—

A.— Enamelling on sheet metal, in various colours, combined with gilding fluxed over.—One prize, £7 10s., for the best, and one of £5 for the second best.

B.—Enamelling on metal, the enamel filling incised lines and surfaces; both opaque and translucent enamels to be introduced on the same plaque.—One prize, £7 10s., for the best, and one of £5 for the second best.

C.—Enamelling on a metal base, the compartments for the enamels being formed by filigree, after the manner of Chinese, Japanese, or Byzantine enamel work. —One prize, £7 10s., for the best, and one of £5 for the second best.

D.—Painting with enamel colours and fired on earthenware slabs.—One prize, £7 10s., for the best, and one of £5 for the second best.

E.—Ditto, on curved or moulded surfaces of earthenware.—One prize, £10, for the best, and one of £5 for the second best.

F.—Ditto in transparent and opaque colours, combined with gilding, fluxed on clear glass.—One prize, £7 10s., for the best, and one of £5 for the second best.

G.—The execution of "filigrani" in glass, after the Venetian fashion.—One prize, £7 10s., for the best, and one of £5 for the second best.

H.—Painting and lacquering on wood or papier maché, after Persian and Indian methods.—One prize, £7 10s., for the best, and one of £5 for the second best.

I.—Damascening in gold, silver, and copper, on steel or iron.—One prize, £7 10s., for the best, and one of £5 for the second best.

J.—Ditto on silver in combination with niello. (The study of Japanese specimens is recommended.)—One prize, £10, for the best, and one of £5 for the second best.

K.—Ditto on brass or white metal.—One prize, £10, for the best, and one of £5 for the second best.

L.—Combination of marquetrie with carving in low relief. (The study of M. Fourdinois' cabinet at South Kensington is recommended.)—One prize, £10, for the best, and one of £5 for the second best.

M.—The combination of gilding or gilt-metal work, with incised ivory or hard wood.—One prize, £7 10s., for the best, and one of £5 for the second best.

N.—Inlay of hard woods, ivory or tortoiseshell, in softer woods or other substances in the solid.—One prize, £7 10s., for the best, and one of £5 for the second best.

O.—Combination of mosaic with carved marble.—One prize, £10, for the best, and one of £5 for the second best.

P.—Ditto and inlay with carved stone.—One prize, £7 10s., for the best, and one of £5 for the second best.

Q.— Carving, involving the combination of not less than three different woods.—One prize, £7 10s., for the best, and one of £5 for the second best.

Second Division. — Specimens of the Application to Ordinary Industry of Prescribed Art Processes.

For the best specimens of :—

A.—The most beautiful dial-face for a clock, not less than nine inches in diameter, in any metal or metals, the principal decoration being by painted enamel on the surface.—One prize of £15 for the best, and one of £10 for the second best.

B.—The most beautiful frame for a miniature; not less than five inches by three inches, in any metal or metals, the principal decorations being produced by enamelling on incised lines and surfaces (as per Process B., First Division).—One prize of £10 for the best, and one of £5 for the second best.

C.—The most beautiful small metal ring-tray for a lady's dressing-table, decorated with filigree enamel (Process C., First Division).—One prize of £10 for the best, and one of £5 for the second best.

D.—The most beautiful earthenware slab, not less than one foot by six inches, painted in enamel colours and fired, for insertion in the frieze of a stone or marble chimney-piece.—One prize of £15 for the best, and one of £10 for the second best.

E.—The most beautiful tablet in moulded or modelled earthenware, painted with enamel colours and fired, for monumental or commemorative purposes, or (say) for bearing the name of a street, or indicating sections of a museum.—One prize of £15 for the best, and one of £7 10s. for the second best.

F.—The most beautiful drinking-vessel of clear glass, decorated in colour, &c. (as per process F., First Division).—One prize of £7 10s. for the best, and one of £5 for the second best.

G.—A champagne glass, with filigrani in the cup, and stem, and foot.—One prize of £7 10s., for the best, and one of £5 for the second best. N.B.—Filigrani may be white or any colour.

H.—A pair of boards for book-covers, suitable for an octavo volume. Decorated within and without according to Process H., First Division.—One prize of £10 for the best, and one of £7 10s. for the second best.

I.—A set of fire-irons, enriched with damascening (as per Process I., First Division.)—One prize of £15 for the best, and one of £7 10s. for the second best.

J.—A silver drinking-cup, to hold not less than half a pint, decorated with damascening and niello (as per Process J., First Division.)—One prize of £15 for the best, and one of £7 10s. for the second best.

K.—A musical instrument, say trumpet, cornet, or saxe-horn, decorated with damascening (as per Process K., First Division.)—One prize of £15 for the best, and one of £10 for the second best. N.B.—It is indispensable that no process shall be used which shall diminish the tone or sonority of the instrument.

L.—An envelope-case, enriched with carving in low relief and marquetrie.—One prize of £15, and one of £7 10s. for the second best.

M.—The most beautiful flute, decorated with gilding, carving, gilt metal work, or incised ornament.—One prize of £15, for the best, and one of £7 10s. for the second best.

N.—A small musical instrument (as a violin or guitar), or any conspicuous or principal part of a large instrument (as a set of pianoforte or organ keys), decorated with inlay of hard woods, ivory, or tortoise-shell, in softer woods, or otherwise combined in the solid.—One prize of £20 for the best, and one of £10 for the second best. N.B.—It is indispensable that no process shall be used which shall diminish the tone or sonority of the instrument.

O.—A pedestal for a bust (less than life-size), forming a clock-case, with an aperture for the dial not less than six inches diameter, consisting of carved marble combined with mosaic.—One prize of £20 for the best, and one of £15 for the second best.

P.—A chimney-piece, suitable for a lady's boudoir; opening, three feet wide by three feet three inches high, in carved stone, enriched with mosaic and inlay.—One prize of £15 for the best, and one of £10 for the second best.

Q.—An occasional table, with a round top, say two feet six inches diameter, decorated with carving, involving the combination of not less than three different woods.—One prize of £15 for the best, and one of £10 for the second best.

R.—Ornamental ironwork for the balcony of a window, 3 feet 6 inches wide, height of balcony 1 foot, the work to be wrought; the specimen may be oiled but not painted.—One prize of £10 for the best, and one of £5 for the second best. N.B.—Extreme elegance is desired in this specimen rather than over-much work.

Proceedings of Institutions.

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UNION OF LANCASHIRE AND CHESHIRE INSTITUTES.

The annual meeting of subscribers and delegates of this Union was held on Wednesday, the 28th ult., at the Manchester Mechanics' Institute, Mr. Alderman Rumney in the chair. There was a large attendance of delegates.

The Hon. Secretary (Dr. Pankhurst) read the annual report of the council, of which the following is an abstract:—

The number of Institutes now in union is 126, of which ten have been admitted during the past year. The following is a summary of returns from 99 Institutes:—Number of members (99 Institutes), 24,159; number of female members (56 Institutes), 2,512; number of members attending elementary evening classes last winter (98 Institutes), 10,145; number attending government science classes in Lancashire and Cheshire, 2,829; number of volumes in library, 157,550; income (89 institutes), £25,680. The value and necessity of statistical information, with regard to the condition of education in the Institutes have been frequently insisted upon by the council. The organization of the Union has been energetically worked in all its departments. The visiting agent (Mr. Lawton), to whose zeal, energy, and devotion the Union owes so much, has never ceased to make the supervision and examination of the class work of the Institutes a leading part of his occupation. He has, in addition to the other departments of his labours, been remarkably successful in strengthening old classes and forming many new ones. The principles which the council have pursued in forming a graduated scheme of examinations have in former reports been fully explained. The result has been that the field of competition has been extended, and the stimulus of honour and reward applied just at those points and in those subjects where experience has proved that it is most needed. The council have never allowed themselves to lose sight of the real relation between thorough elementary instruction and systematic technical education. After giving a classified statement of the result of the examinations, the report proceeded to state that the object of the council in establishing the special prize scheme has been achieved in an eminent degree. It has stimulated those who have disciplined their faculties by regular training to engage in competitive contests where success tended to the acquisition of sound and comprehensive views of the scientific principles of the arts of production and design. Other subjects in the scheme relate to the laws of economic science. The plan of granting rewards upon the results of competition, of which the tests should be attainment of "the highest aggregate number of marks" in the subjects of several examinations, has proved both sound and successful. The foundation of the "Rumney Science and Art Exhibition" was a subject of congratulation on the occasion of the last annual meeting. Happily, the excellent influence of this provision for successful merit has been doubled, by the establishment of a second "exhibition," by means of the association of the grant of the Government with the funds so kindly furnished by Mr. Rumney. This "exhibition" will, without doubt, provoke imitation on the part of others who value the cause of popular education. The great success of the Union in the diffusion of science teaching, so manifest on the occasion of the last report, has been more than maintained during the year just closed. In the organisation of science classes in connection with the Department, and in the economical distribution of teaching power, the original policy of the Council has been steadily prosecuted. Upon the number of science classes in connection with the Union, and the area over which they extend, the official inspectors of the Government report in terms of the highest commendation. An analysis of the results of the Government science classes shows that in Lancashire and Cheshire 2,829 students were, during the past year, receiving instruction. Of this number 180 attended science classes in connection with day schools, while 435 attended classes not connected with the Union. There was, therefore, the considerable number of 2,214 members attending evening science classes in the Lancashire and Cheshire Institutes of the Union. At the May examination 1,499 "results" were obtained by Lancashire and Cheshire candidates, of which number 929 were artisans, excluding schoolmasters, clerks, and bookkeepers. Hence it appears that the present provision for science teaching has placed many of the artisan class under instruction in science, whilst the subjects principally taught show that the information communicated relates very intimately to the principles and methods of the industries and arts, in the practice of which they are engaged from day to day. The Council are deeply sensible of the defective character of the existing provision for technical education, but they use every exertion in their power to apply to the fullest extent the means within their reach, while they endeavour, as far as in them lies, to prepare the way for a more comprehensive scheme. It is demanded by the necessities of the time that an efficient system, on the one hand of elementary instruction, and on the other of systematic science teaching, should be placed in a state of mutual inter-dependence, so that the course of mental discipline on the part of the student may be constant and continuous. The principles upon which the Council originally framed their procedure with regard to female instruction they still acknowledge and follow. That particular excellencies and attainments must be subsequent to and based upon adequate general culture is a proposition of universal value and application in all true education. The prize scheme in this department deserves special attention. The Council of the Society of Arts have offered a special prize of £10 10s. No extensive action will take place in female education until there is a cordial recognition of the principle that a noble life in woman depends as essentially upon true mental culture as it does in man.

The statement of the financial position of the Union appended to the report showed that the receipts for the year ending August 31 amounted to £405 0s. 6d., whilst the sum expended was £416 1s. 11d. There was a balance of £11 1s. 7d. against the Union.

The following is an extract from the report of the visiting agent (Mr. Thomas Lawton):—"During the past year I have inspected the elementary evening classes of 58 Institutes, and delivered 50 public addresses. Arrangements have been made for the opening of new classes at the following Institutes:—Accrington, Altrincham, Chapel-Town, Church, Farnworth, Freetown, Glossop (this class will include members from six Institutes in the Glossop district), Haslingden, Hurst, Pendleton Club (two Institutes), Southport, Staleybridge (three Institutes), Sunnyside, near Bolton; Upper Mill (two Institutes), Whitworth, St. George's Schools, Oldham-road, Manchester; Openshaw, Colne, Blackley, and St. Helens. With three exceptions the new classes are for geometrical and mechanical drawing and building construction. Last winter I examined 3,217 pupils in dictation and arithmetic. There was a decided improvement in the organisation of the elementary classes. The teaching power was much better, the black board was more frequently used, dictation was more generally practised, and in many cases the course of study was specially arranged to prepare the pupils for the elementary examinations. The results of my inspection vary considerably. In some districts the papers were very creditable, while in others both the dictation and the arithmetic were very poor. In some Institutes the per-centage of errors in spelling was much greater than last year. This may be accounted for on the ground that the material was much worse in 1867 than in 1866. There was a large influx of new members, and many of these were almost unable to read or write. But while on the other hand it may and does for the present bring down the status of an Institute in the inspection, yet the entrance of a large number of ignorant youths upon regular class instruction amply compensates for the loss of three or four per cent. of examination results. Out of 3,217 examined, 595 were absolutely unable to write down a simple sentence, 711 made three mistakes and upwards in spelling. 1,300 were able to put down from dictation and work correctly a simple sum in addition. I would strongly recommend committees to see that the pupils are at certain times, say once a month, put through a written examination. With very few exceptions, the arrangements for female education do not rise above reading, writing, dictation, arithmetic, and sewing. It is very desirable that classes for special instruction in domestic economy and physiology, relating to the laws of health, should be organised. The small number of candidates at our examinations in these subjects is attributable mainly to the fact that there is scarcely a class in existence. A class, numbering about fifteen pupils, has just been established at Church-Kirk, near Accrington. At the government science examinations, held in May last, not a single certificate was awarded to female candidates, simply, as I believe, because no one was examined. At the Society of Arts examination the following results were obtained:—Bacup, one 3rd class, domestic economy; Bury, one 3rd class, free-hand drawing; Droylsden, one 3rd class, domestic economy; Macclesfield, one 2nd class, domestic economy; Preston, one 3rd class, domestic economy; Salford W.M.C., four 3rd class, free-hand drawing: two 2nd, and one 3rd class, French; one 3rd class, German.

The Chairman moved the adoption of the report, which was seconded by Mr. T. Bazley, M.P.

The report having been adopted, a vote of thanks was passed to the council and the officers for their past services.

Dr. Pankhurst acknowledged the vote.

Mr. Traice moved the following resolution:—"That, in the opinion of this meeting, it is highly desirable that every Institution in Union should have well appointed classes for primary instruction, and science classes for geometrical drawing, mechanical and machine drawing, building construction, chemistry, animal physiology, and theoretical and applied mechanics, in addition to any class which may be appointed of special importance to particular districts."

Dr. Watts, in seconding the resolution, referred to the progress which had been made since the establishment of the union. In 1864, the number of certificates granted was 72, and in the present year 586. In the Society of Arts examinations, 247 certificates were earned in 1864, and this year the number was 422. In the Government Science Classes he found that in 1864 518 certificates were earned, and that number had increased this year to 1,499, 929 of which were taken by artizans. He found that in this last year the number of science class pupils was 600, and the total number of certificates earned throughout the country for the year was 8,654. Of that number the Institutions in the Lancashire and Cheshire Union had taken 1,499, or very nearly one-fourth. But they must be more active in the work even than they had been in the present year. There was plenty of room for it, because he found that, according to the return of last winter, 59 of the Institutions of the union had science classes, and 63 had not. Some of them, possibly, had not even an elementary class. Looking to the state of instruction throughout the country, it seemed to him most reprehensible that an Institution should exist, calling itself a literary Institute, having no means of bringing up the youths who had been neglected in the primary schools, so as, at any rate, to enable them to read, write, and work out arithmetic. In some cases he was sorry to see that science classes had been attempted to be worked where elementary instruction had been very deficient, and consequently the work had been ineffective, as far as results went. The grand defect was, no doubt, a want of the elementary system. In Germany, for many years, the youth could get free instruction. In France a series of decrees had lately been issued, arising out of a commission which had been examining the state of instruction in Germany, and which sought to utilise all the French institutions in the same manner, and make it possible for every deserving youth to secure a free instruction. Wherever a grammar school existed in this country, public opinion should be taken, and either an improved teaching should be adopted, or the public, through the trustees—and if they refused, through the Charity Commissioners—should seek to have scientific teaching introduced. The Manchester Grammar School, after three years' fighting in Chancery, had got the liberty of admitting paying pupils, and now they had an additional income of £1,200 a year, and he hoped to live to see the time when it should be educating 1,000 scholars, forming a main feeder to a university, of which Owens College should be the centre.

The resolution was supported by Mr. Alderman WILKINSON (Burnley), Mr. DAVID MORRIS, Rev. Mr. STORREY, Mr. PLANT, and Dr. PANKHURST, and unanimously adopted.

The proceedings terminated with a vote of thanks to the Chairman.

In the evening the Marquis of Salisbury distributed the prizes in connection with the Union in the Free-trade Hall. The chair was occupied by Mr. Thomas Bazley, M.P., and amongst those present were Mr. Jacob Bright, M.P., Sir Edward Watkin, M.P., Mr. Wright Turner, Principal Greenwood (Owens College), Mr. Ernest Jones, &c.

Before the presentation of the prizes the Marquis of SALISBURY delivered an address on education. He deprecated the collection of funds for educational purposes by local rating, which had its advantages when economy was an object; but in the present case, when they were desiring rather to stimulate an expenditure in a matter whose importance is not sufficiently appreciated, he deprecated the application of a machinery which has excessive economy for its chief object. That was the reason why he, when it came to a question—as he hoped it would soon come—as to a larger expenditure of the public money for the cause of education, would recommend grants from the Imperial exchequer in preference to the adoption of local rates. The great difficulty, however, to be overcome was the indifference of the people on the subject of education, and to remedy this they had heard proposals, which sounded strange to English ears, of compulsory laws for forcing parents to send their children to school, whether they liked it or not. It was true that such laws existed in several other countries, but he thought them utterly unsuitable to England. For his own part he viewed with apprehension these recommendations for compulsory legislation. His fear was that, if they did not make a great success, they would make a tremendous failure; if they did not succeed in driving children into schools, they would drive the parents into opposition to all schools; they would implant in their minds a hatred of education, as of something directly imposed upon them, which would do more to hinder their efforts in the future than any slackness or tardiness of which they had to complain now. He believed that in the spirit which animated these confederated Institutes a more excellent way would be found.

After enlarging upon the subject at considerable length, the noble Marquis distributed the prizes to the successful candidates, and accompanied the gift of each prize with a few appropriate words of encouragement.

Mr. JACOB BRIGHT, M.P., moved a vote of thanks to the Marquis of Salisbury.

Sir E. WATKIN, M.P., Principal GREENWOOD, of Owens College, and Mr. ERNEST JONES supported the resolution, the latter gentleman dwelling at some length upon his conviction that there was a thirst for education among the working classes, and a desire for the enactment of compulsory education.

The Marquis of SALISBURY acknowledged the compliment, and moved a vote of thanks to the chairman.

Mr. BREMNER having briefly seconded the resolution, which was carried amid general applause, the Chairman responded, and the meeting separated.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—*Todmorden Mechanics' Institute.*—The annual *soirée* of this Institution took place at the Oddfellows' Hall, which was crowded to excess, on October 21. In the absence of Mr. J. Fielden, the president, who is contesting the Riding, the chair was taken by Mr. Eastwood, one of the vice-presidents. Addresses were given by Mr. Henry H. Sales, on "The Work of Mechanics' Institutes in connection with Technical Education;" by the Rev. A. Molesworth, vicar, on "Books;" and by Mr. Crowther, a factory operative, on "Social Duties." The Todmorden band and a party of glee singers took part in the proceedings. *Halton Institute.*—The annual lecture was given by Mr. Henry H. Sales, on the 29th ult., subject, "The history of the manufacture of clocks." The Rev. G. M. Platt, vicar of Whitkirk, occupied the chair. *Hunslet Mechanics' Institute.*—The annual *soirée* and distribution of prizes and certificates took place on the 27th ult. The large hall was densely crowded. Sir A. Fairbairn presided, and was supported by Mr. E. Baines, M.P., Aldermen Carter and Blackburn, Councillors Gaunt and Shepherd, &c. Letters of apology for unavoidable absence had been received from Alderman Luccock, Mr. Sales, and other gentlemen. *Gomersal Mechanics' Institution.*—A public meeting was held at this Institution on the 30th ult., to take into consideration the formation of science classes. Mr. H. Ellis, the president, who occupied the chair, urged upon the audience the importance of the subject they had met to consider, by reference to the circumstances of his own mill. After Mr. Henry H. Sales had detailed the scheme of the Department of Science and Art, and Mr. J. Patchett the programme of the proposed classes, together with the mode of instruction therein, it was unanimously resolved to establish the classes forthwith. *Hebden-bridge Mechanics' Institution.*—The fourteenth annual *soirée* was held in the mill of Messrs. Crossley, on the 31st ult., and as usual was largely attended. Mr. H. Horsfall, president, in the chair. The following addresses were given:—"On Science Classes," by Mr. Henry H. Sales; "On Perseverance," by Mr. Buckley; and "On the value of Knowledge," by the Rev. S. D. Hillman. *Pudsey Mechanics' Institution.*—On October 26th, the twenty-first annual *soirée* of the Pudsey Mechanics' Institute was held at the Town Hall at Pudsey. The *soirée* commenced about four o'clock; there were several "sittings down," and it is calculated that upwards of 400 partook of tea. In the evening a public meeting and concert was held, presided over by the Rev. H. J. Graham. Amusing and instructive addresses were delivered by the Rev. G. Robinson, C. B. Ellis, W. Jowett, and J. Bevan, Messrs. H. H. Sales, J. Walker, J. Town, S. Rayner, and J. Boyes. The annual report was read by one of the secretaries, Mr. Robert Salter, jun. The report stated that the premises were so limited that it had necessarily prevented them from accommodating their classes in a desirable manner, and they had consequently to report a slight falling off in their numbers. The project for the erection of a new Mechanics' Institute met with the hearty support of their fellow-townspeople, and the committee strenuously endeavoured to give effect to their benevolent promises by the selection of a suitable site, though as yet without result. The committee, however, trust for aid from their public-spirited friends to help them out of their difficulty, and they were more encouraged to hope this from the fact of the noble aid hitherto afforded. The news-room was supplied with five newspapers daily, and seven weekly publications. It was well attended, and seemed to be much valued. There were male and female classes, attended by 85 male members and 44 females. The report, which was considered satisfactory, was unanimously adopted. The musical part of the entertainment was carried out by Miss Newbound, Miss Anna Hiles, and Mr. Pickles. Mr. Wilson presided at the pianoforte.

HAVRE EXHIBITION.

This exhibition has been closed, according to previous announcement, by a ceremony and banquet, at which the Minister of Commerce was the guest of honour, and was supported by all the notabilities of the town and department.

The minister made an excellent practical speech, in which he referred to the importance of the commercial relations between England and France, which since 1848 had grown in value from eight to seventy-two millions sterling per annum. He also made special reference to the large proportion of English amongst the foreign exhibitors, the numbers in the official report being as follows:—

Great Britain	494
North and South America	262
Germany	193
Belgium	178
Holland	123
Denmark	52
Switzerland	36
Turkey	32
Italy	23
Spain	21
Portugal	11
Persia	2
Siam (The King)	1
	1,428

The number of French exhibitors amounted to 4,427, exclusive of the fine art department, agricultural, horticultural, and other shows, in which foreigners took no part.

The lists of awards are not yet completely made up, but the following are the principal recompenses accorded to British exhibitors:—

Diplomas of Honour.

Messrs. Napier and Sons, Glasgow, the only recipients in the shipbuilding class of this highest award, with the exception of the Great Steam Company of the Messageries Impériales.
Messrs. Parkinson and Frodsham, London. — Chronometers.
Frank Buckland, Esq.—Pisciculture.
The Barrow Hæmatite Steel Company.
James Russell, Wednesbury.—Iron tubes.
Thomas Daniel and Co., London.—Colonial products.
Wayne and Co., Cardiff.—Coal.

Gold Medals.

Mr. Claude Martin, Newcastle.—Anchors.
Kulberg, London.—Chronometers.
The Board of Trade, London. — Rocket life-saving apparatus.
Mr. George Borwick, London.—Baking powder.
Mr. Schmidt, Liverpool.—Road locomotive.
Price's Patent Candle Co.
Crace Calvert and Co., Manchester.—Phenic Acid.
Sir William Rose and Co., London.—Railway grease.
J. C. and J. Field, London.—Candles.
John Bowes and Co.—Coke.
John Brogden and Sons.—Coal.
Johnson and Co., London.—Cements.
Francis and Co., London.—Cements.
Hinks, Wells, and Co.—Steel pens.

The other medals and awards cannot be given with accuracy at present, and the list is long. In class I., shipbuilding, &c., there are a dozen awards to English exhibitors, and in classes III. and IV. as many, if not more.

PHOSPHATES IN AGRICULTURE.

Much attention has been given of late in France to the treatment of coprolites and other bodies containing phosphates applicable as manures; and an agricultural writer, M. Adolphe Bobierre, has given, in the *Journal de l'Agriculture*, of Paris, an account of the methods in action, and experiments in connection with, this important question.

"Guanos from tropical regions," says M. Bobierre, "bone ashes from the pampas of Central America, phosphorites and apatites from Spain and Portugal, coprolites and nodules from the early limestone formation, the refuse of sugar-houses and refineries, gelatine and button manufactories, everything in fact which contains phosphoric acid in any quantity, is now the object of serious, and generally profitable, application. Guano is obtained from the giddy heights of the mountain peaks in sight of the coast of Bolivia, while in the Ardennes it is found worth while to remove sixty or more mètres of argillaceous earth to obtain a ton of phosphated nodules, which, when washed and pulverised, rival bone-black."

The writer recognises the great activity of English chemists and agriculturists with respect to phosphates and the production of superphosphates, and the immense services which they have rendered; but adds, that the manufacture of superphosphates cannot be said to be perfect so long as the sulphuric acid is lost.

With respect to what has been done in France, M. Bobierre gives some interesting examples. The nodules of phosphate of lime have been largely employed in Brittany, in the cultivation of the Landes, in the place of bone-black, which has been used largely for thirty or forty years; this has created a very important employment; and we are told that many of the dealers in manure have entirely given up the sale of bone-black for that of pulverised fossil phosphates. Attempts have been made to separate the phosphates from the thirty per cent. or more of silicious matter with which they are associated, and also, on the other hand, to produce mixed manures, in which the activity of the phosphoric acid should be brought out in the most effective manner; these desiderata have been realised with considerable success. One process is to treat the rough phosphates with chlorohydric acid, and to recover the acid by evaporation. Another process mentioned is to convert the nodules into metallic phosphites by calcination in a blast furnace, in contact with iron ore, and then to transform the metallic phosphites into alkaline phosphates by the action of chloride of sodium at a high temperature. A third method is to attack the fossil phosphates by means of chloride of manganese with an excess of acid, obtained from the manufactories of chlorides for bleaching and other purposes; and, lastly, the fossils are sometimes simply calcined with gas tar or other similar substances.

The writer says that the results of the above methods and experiments have confirmed him in a previously expressed opinion, that if the nodules be reduced to a powder, and the powder exposed to the action of the air, and applied to soil requiring the application of phosphoric acid the fossil phosphates are perfectly assimilated; and, further, that a mixture of fossil phosphates with ordinary manure yields the most admirable results, even in the case of old cultivated lands. "Let farmers only adopt the habit of throwing fossil phosphates under the animals," says the writer; "nothing more is required."

M. Bobierre seems to consider the treatment of nodules by means of acids as scarcely called for, but recommends this process strongly in the case of phosphorites, apatites, and certain phosphatic guanos found almost in a vitrified condition.

With respect to France, the writer observes that within a short distance of the coasts of Spain and Portugal, where the tribasic phosphates, containing 70 to 90 per cent. of phosphate, may be obtained at the rate of 2s. 6d. to 3s. 4d. per cwt., enormous quanties of hydrochloric acid are wasted, and worse than wasted, by being allowed to vitiate the air; the town of Marseilles, which converts large quantites of sea-salt into sulphate of soda, is destined to waste annually fifty millions of pounds of hydrochloric acid, which could, with very little trouble, be made to dissolve the natural phosphates.

In connection with the above may be mentioned a communication made by MM. Dusart and Pelouze, to the Academy of Sciences. One of these gentlemen, in a work entitled "Researches on the Assimilation of Phosphate of Lime," showed that, when acted upon by the gastric juice and very diluted lactic acid, phosphate of lime underwent partial decomposition, yielding a mixture of lactate and acid phosphate of lime; this led to experiments on the action of carbonic acid on phosphate of lime, with the view to throw some light on the obscure subject of the assimilation of phosphate of lime by plants. In 1864, M. Dumas noticed that carbonic acid was a solvent for phosphate of lime, by the effect of seltzer water, in softening ivory and abstracting all the calcareous phosphate therefrom. Other chemists have regarded this action as merely a solution of the salt by the carbonic acid, but MM. Dusart and Pelouze are of opinion that the action referred to is of a more complicated character, and that the acid absorbed gives birth to new products.

These gentlemen treated gelatinous phosphate of lime with water, saturated with carbonic acid, and found that after some time the acid had partly disappeared, and the phosphate itself had notably diminished; the transparent liquid obtained by filtration deposits by heat a crystalline precipitate, composed of phosphate and carbonate of lime. A series of nice experiments is then detailed to prove that bibasic phosphate of lime is produced, either by the action of carbonic acid on tribasic phosphate of lime, or by that of acid phosphate of lime on the carbonate. On this principle, say MM. Dusart and Pelouze, we have been able to produce it, by the following economic practical method, in such a state of purity that, compared with superphosphate, it contains double the active power in an equal volume. The matter to be dealt with, natural phosphates, coprolites, bones or animal charcoal, are placed in wooden vats lined with lead, communicating with each other and covered with a mixture of water and acid; any acid will effect the transformation, but we prefer hydrochloric acid or the weak nitric acid, which is wasted in so many works. When the acid has macerated in one vat, we remove it into a second, and if necessary a third, and the clear liquor is finally treated with pulverised carbonate of lime; effervescence is produced, carbonic acid is thrown off, and a precipitate of white crystalline bibasic phosphate of lime is thrown down. When sufficient carbonate is used the liquor is deprived of all the phosphate that it contains, and the precipitate is easily dried and washed.

These facts enable the chemists in question to form the following hypothesis concerning the manner in which nature enables plants to take up phosphates. It is evidently in the soluble form that the plant uses them for its nutrition; the common phosphate of lime, completely insoluble in water, should therefore be rendered soluble. Carbonic acid dissolved in water performs this first transformation in the same way that the stomach of an animal renders it soluble by converting it into acid phosphate and lactate of lime. The enormous quantity of superphosphate of lime employed in England, a practice now adopted in France, is quoted in support of the above theory. The superphosphate, which, according to these gentlemen, is only an impure acid phosphate of lime, when introduced into the soil attacks the carbonate of lime, under the influence of humidity, and is thus transformed into a bibasic phosphate. As it is impossible to imagine that any substance can be entirely absorbed by plants during the first few days of its being spread upon the ground, if the superphosphates do not undergo this transformation, which diminishes their too great solubility, they would certainly be carried down to the sub-soil by the first heavy rain, and part of their value thus lost. The facility with which bibasic phosphate of lime can be produced in a state of great purity renders it a promising substitute for common phosphate, and even for superphosphate, which is always mixed with a large proportion of other matters, which have no value as manure, and of which the cost of carriage is, therefore, at any rate, a loss to the farmer.

HIRN'S TELODYNAMIC TRANSMITTER.

This invention, already referred to in the *Journal* (present vol., p. 608), is thus described by Mr. Scott Russell, in his "Report on Prime Movers, Boilers, and Engines, specially adapted to the Requirements of the (Paris) Exhibition.[*]"

"It will now be necessary to say a few words to justify the selection I have made of the telodynamic transmitter of mechanical power, invented by M. Hirn, as a discovery or invention possessing high virtue as an engine for the future development of the mechanical resources of power for manufacturing nations. Who can have stood beside the Falls of Niagara, of the Rhine, or of the Clyde, without feeling awed by an overwhelming sense of the development of enormous power in the descent of these huge masses of water continually pouring, night and day, millions of tons through millions of feet? What engineer could stand by these millions of horse-power wasted and not feel the irresistible longing to turn this wasted power into sources of useful work? Unhappily, the situation of such a waterfall is not a matter of choice; it is there, and ordinarily not in a place convenient or capable of serving as the home of an industrious manufacturing community. It is impossible not to feel the wish to transport this waterfall into the midst of the adjacent town, to give life and motion to its mills and manufactories, so as to supersede its smoke and economise its fuel by the simple weight of falling water. M. Hirn has proposed to himself this simple problem:—'How shall I take the power of the water away to a distance from the waterfall without having the trouble of taking here also the water itself?' The solution he attained is remarkable, equally for its fascinating simplicity and its philosophical depth. 'I cannot carry the matter of the waterfall, but I will carry its spirit.' The essence of its power, the spirit of the waterfall, is *speed*. 'I will carry speed, velocity, force, from the waterfall; but I will not carry water, matter, weight, or, if I do, I will carry as little as I can of dead matter, and as much as I can of living speed.' This is what he sought to do—how to transport speed.

"This transport of power to great distances at small expense, both of capital and current cost, is what I have ventured to consider as a discovery or invention of no common importance in the future economy of nations. A river rushes down a broad valley; villages and towns dot the valley and fringe the mountains; there is an industrious population which can only develop its manufacturing industry by the aid of foreign far-fetched supplies of fuel. M. Hirn leaves the villages where they are, but spreads out on each side of the river from river bank to mountain foot — one, two, three, or five miles on each hand — the long lines of his telodynamic communication. On the river itself he erects his water-wheels or prime movers, and there extracts from the water its moving force. He uses, to embody that force, a small mass of steel or iron, not more than a finger's thickness, or about the diameter of a musket-ball: this steel cord he shoots along, with a velocity of 100ft. in a second, or 6,000ft. a minute. Flying with this speed of 30 or 60 miles an hour, this dynamic messenger carries its deposit of power and delivers it out at the end of a journey of a few miles with only a moderate per-centage of loss on the way. How small this loss, it must have required the most sanguine of inventors to believe! indeed, at starting it was anything but small; his early transmitter of speed flew to pieces in the act of transmission, his steel rope wore out long before it had paid for its cost, and his wheels eat themselves to pieces faster than their work would pay for duty done. M. Hirn had everything to invent, and it was years before he taught his egg to stand on end merely by the gentle crack of Columbus. The Columbus egg, to him, was the discovery of gutta-percha, and how he employed it to transmit speed by steel without waste may be told here in a few words.

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[*] These "Reports" were prepared for the Science and Art Department, and are published in a Blue book.

"The mechanism by which M. Hirn accomplishes this transfer is so simple, and, after it has been described, so obviously effectual, that a few words put us in possession of the entire system and method. Given a waterfall of 100-horse power and a town five miles away, an ordinary water-wheel is erected at the fall to receive its power, and the ordinary machinery of the factory to be driven is erected in the town. On a framing, some height above the ground, is erected a simple iron wheel or pulley, 12ft. in diameter, with a groove in its circumference. A similar framing, with a similar wheel, is erected at the factory in the town. A wire or steel rope not thicker than one's finger traverses the whole distance along pulleys, some 6ft. in diameter, placed 150 yards apart, and this simple rope transfers through the whole five miles the whole force of the water-wheel at the fall with the loss of some 20-horse power only in the transmission. Here, it will be said, is no invention. Nevertheless, the process, as I have now described it, would not be successful. So small a rope could not transfer 100-horse power, neither would the ropes nor the pulleys last; it has neither economy nor endurance. To make the arrangement successful, we must add M. Hirn's idea of speed—of extremely high speed. Instead of driving his pulleys at an ordinary pace, he makes the rope travel 20, 30, 50 miles an hour; and it is this speed alone which enables so slender a cord to transmit so enormous a power. When he had made this discovery his invention failed, for no materials would endure at this high speed either for his rope or his wheels; iron, steel, copper, brass, bronze, leather, wood—all were tried and failed. At last he discovered a simple expedient: all round his pulleys he cuts a deep dovetailed groove, into which he hammers, till it is filled, a hard compact mass of gutta-percha, and in the gutta-percha he leaves a groove. This done, his invention is complete, effectual, durable, economical. It has lasted seven years in this state, and has been successfully applied in some 400 instances."

On the same subject, Mr. Robert Mallet, in his Report "On Machines and Mechanical Apparatus in General," writes:—

"No more remarkable, nor, probably, as regards its future, more important object, is exhibited on this occasion, than is the arrangement of M. Hirn for the transfer to great distances of power and motion by the rapid transfer of an endless wire of small diameter over large and peculiarly-constructed pulleys, one of which is at the transmitting and the other at the receiving end of the telodynamic range. At first sight, or to the casual observer, M. Hirn's arrangement, which was without interruption at work in the park, where it transmitted through a wire not thicker than a large pencil, about 25-horse power (nominal), to actuate pumps (supplying the building) at a distance from the source of power of several hundred feet, appears but one form of the old well-known strap or belt, with its strap pulleys; and it is so much, but it is also much more, for it involves and is based upon a principle which had not before been made available for the transmission of power to great distances.

"This may be popularly stated thus:—When work, that is pressure and motion together, has to be trnsmitted by tension through a cord or fibre, such as a wire or rod of iron, or other material, a given amount of work in a unit of time can be always transmitted through a smaller and smaller section of fibre or rod in proportion as we increase the velocity with which a point in the transmitting fibre or rod travels; so that the product of the pressure and of the velocity with which it acts to produce work shall be constant. For example, a cylindrical bar of iron of 1in. diameter, we may say, can transmit a pull of 10 tons through itself without stretching; and if, that pull being always on the rod, a point in its length passes a given fixed point at the rate, let us say, of 5ft. per second, then at that point the rod is transmitting work at the rate of 10 tons × 5ft., = 50-foot tons per second.

"But if we have another rod of the same material, of only one-tenth of an inch in diameter, which will therefore have 1-100th the cross section of the 1-inch bar, this will bear, without stretching permanently, the 1-100th of 10 tons, or 1-10th of a ton. Now, if this last rod transmits this pressure of 1-10th of a ton past a given fixed point at a rate one hundred times as fast as in the former instance, then the work transmitted by the small and the great rod shall be equal in equal time. Or—

1-in. bar, 10 tons × 5ft. = 50-foot tons.
1-10th-in. bar, 1-10th tons × 5ft. × 100 = 50-foot tons.

But this last is a mere wire, and will be light and flexible enough to be passed round the rims of large pulleys at such high speed, and by friction on these rims (friction for equal pressures being the same at all velocities within large limits) to transfer the work to their axes in way of rotation. Thus, theoretically, the power of the largest steam-engine in the world might be transmitted to any distance through a human hair. The practical limit with steel wire is found, however, about where the diameter is reduced from two to three-tenths of an inch. The limit of velocity is only that at which by centrifugal force or want of perfect balance the pulleys might become deranged or unsafe.

"M. Hirn has, by this beautiful simple adaptation in practice of a dynamic principle, succeeded in transmitting the power which drives large factories to great distances; in some cases as far as across the Rhine near Schaffhausen."

Fine Arts.

The Fine Arts in Russia.—The Russian Government is busily occupied in improving its means of artistic and scientific education; all the establishments connected therewith being enlarged or improved. The annual report on the Imperial Academy of the Beaux Arts details the improvements that have been made in its galleries and classes; a considerable number of pictures and other works of art, which had remained almost forgotten in the lumber-rooms of the Academy, have been carefully examined, and those which were deemed worthy of it have been, or are now being restored. The library of the Academy, which includes

30,000 volumes and 120,000 engravings and plates, has been placed in a new building, offering every desirable convenience for study, and a catalogue of the contents is now being prepared by Mr. Klagès, member of the Academy.

Manufactures.

The Future of Deptford Dock-yard.—The following is from the *Greenwich and Deptford Chronicle*:—"We understand that a movement is being made for the purpose of utilising and giving practical effect to what is considered of great importance and moment to the locality. The Lords Commissioners of the Admiralty having decided upon closing the Royal Yard, Deptford, and there being no probability of its being required for ship-building purposes, the question has been considered what can best be done to create a new trade, and give profitable employment to the artisans and other workmen, and be a source of profit and prosperity to the general neighbourhood. There has been a futile idea that it will be required by the War Department for stores from the Tower and other places, but there has not been the least official intimation, and seeing the large reduction in all departments, the report is shown to be entirely groundless. It has, therefore, been proposed, and has received the assent of a large number of the inhabitants, to make an arrangement with the Government to let the different workshops, all of which may be converted into workshops with motive power, and the various appliances and machinery to different mechanical trades and handicrafts. It is well-known that there are a large number of manufacturers in and about London who would highly prize the opportunity of such accommodation, who are now compelled to carry on their business in places prejudicial to health, and at a very large expense. There is another purpose to which a part may be usefully applied. It has been concluded by the artisans and others who visited the late Paris Exhibition that workmen in this country have not the same facilities as in France. Technical and the higher branches of mechanical education is now considered by all practical men of the highest importance. In order, therefore, to give an impetus in this direction, model workshops for new designs and inventions must be established. It is to be regretted that, while encouragement, and rightly too, has been given to what in common phraseology may be termed the science of figures, little or no assistance has been given to mechanical art science; we hope that local efforts will not be wanting to carry out the object in view. We are glad to see the approaches to the dock-yard, as if in anticipation of a successful issue, likely to be greatly improved, and the new edifices that are being raised are indications of anticipated prosperity. Such a prospect will commend itself, we think, to every man of progress, and be highly advantageous to genius and science, and give recreative pleasure and profit to the sons of toil, be conducive to an increase of trade and commerce in this borough, and the development of increased prosperity to the nation."

Secure Cement for Envelopes.—The editor of the *Practical Mechanics' Journal* says that the thick glutinous juice which is found in considerable quantities in the interior folds of the leaves of the New Zealand flax *(Phormium tenax)*, and which is, in fact, a sort of hemp in natural solution, possesses the properties desired. While liquid it can be used as common gum; but once dry, no ordinary solvent has any action upon it. This natural product might be collected, and probably without prohibitory expense and in sufficient abundance, as the *Phormium* is a New Zealand weed, covering whole square miles. It is still open to experiment for the colonists there to add this to their produce, and it is for some of our Waterlows or Spottiswoodes to initiate it, by getting to England such a first supply of the juice as would enable our chemists to examine its precise nature, and to assign the conditions for, and limitations to, its use for envelopes. It is said that silk dissolved in chloride of zinc affords another sort of liquid cement presenting some, at least, of the characters here needed; but it has others which are objectionable, as tending to destroy in time the paper. Again, it is stated that a solution of pure woody fibre in ammonio-chloride of copper embraces the requisite properties. Dr. Scoffern has, the writer believes, experimented a good deal upon this and other uses for this very singular compound, but he is not aware how far it has been found suited to closing envelopes. He does not anticipate well of it in some respects, and those the same as render the silk solution objectionable.

Commerce.

The Iron Trade in Belgium.—During the first seven months of the present year the exports of cast iron from Belgium amounted to 10,509 tons, as compared with 7,082 tons in 1867, and 10,404 tons in 1866. This shows an increase of 3,427 tons in the exports during the same period in 1867, and 105 on those of 1866. The imports which in 1867 were 34,548 tons, in 1868 amounted to only 24,532 tons.

The Vintage in France.—The vintage in France, according to the *Moniteur Universel*, amounted this year to from 50 to 60 millions of hectolitres. In 1865, the production of wine amounted to 68,393,000 hectolitres; in 1866, to 63,838,000 hectolitres; and in 1867, to 55,000,000 hectolitres.

British Capital and the Sherry Trade.—"The sherry trade in Andalusia," says the *Produce Markets Review*, "about twenty-five years ago, assumed greatly increased proportions, and now a vast amount of British property is accumulated in this district, represented by various stocks of wines of various qualities, vineyards, agricultural and pastoral farms, and also by mining investments. In Jerez de la Frontera, alone, for instance, there are about twelve English houses, whose property in wine and land are estimated at £2,230,000. The Spaniards generally value the British property at Jerez at £4,000,000. The British property at Port St. Mary's represents a sum of £453,000; at Seville, £360,000. In the mining districts near Cordova, about £480,000 British capital is invested in the Huelva districts; £580,000 in Cadiz and other towns; general trade and ship-owning, £350,000. There is, besides, an English railway between Utrera and Moron, the capital of which amounts to £650,000."

Colonies.

Copper at the Cape of Good Hope.—The site of the first discovery of copper in Kafirland is in a part of the Insizwa Mountains, at a point about twelve miles from the southern boundary of Natal. The mountain itself has an area of one hundred square miles, and is situated on the right bank of the Umzimkulu, a branch of the Umzimvubu. The mine, if mine it is to be, is not more than eighty miles from the Port St. John, and the road between the two places could be easily made good throughout. About ten miles to the south-west of the Insizwa there is another mountain, of the same character and size, which is said to contain copper. This mountain is also near the same feeder of the Umzimvubu. When Dr. Sutherland, Surveyor-General of Natal, visited the mines, the quantity of ore excavated was about one-quarter of a ton, all taken from the surface. By the aid of natives the main vein was laid open, and traced into a mountain to a distance of eleven feet. This vein is about eighteen by two and a half feet in depth and thickness. The ore is replaced by a yellow ocherous deposit containing nodules of very pure carbonate of copper or malachite, varying in size from a pea to masses of ten or fifteen pounds weight. At a vertical height above the vein masses of ore are found very different from that in the vein itself. The ore varies in quality, the chief impurities being iron and clay. In one section of the rock there is a perceptible infiltration of carbonate of copper, filling all the fissures in the lines of cleavage. This has been traced to a depth of one foot. A party of miners from Durban subsequently carried the excavations seventeen feet further into the mountain, when the vein was again struck, and ore of superior quality obtained. Portions of considerable masses have been found to contain as high as 56 per cent. of metal, and others from 15 to 25 per cent., the average of all being 30 to 40 per cent. The mines are in Faku's territory, the Insizwa mountain being, however, occupied by the petty chief Jojo. It is this fact which makes it difficult for the Natal or Cape Government to move in the matter. The per-centage of copper is put down at 20·50 per cent. Silver was found to the extent of 5·30 ounces per ton of 21 cwt. A trace of gold was also detected. The value of the ore was placed at 14s. 6d. per cent., or £14 17s. 3d. per ton of 21 cwt.

Live Stock in the Australian Colonies.—The Registrar-General of New South Wales has published an interesting statement as to the live stock in the Australian colonies. From this it appears that in New South Wales the horses had increased in number from 273,389 in 1863 to 280,201 in 1868; the horned cattle had fallen off from 2,620,383 to 1,728,427; the sheep had multiplied from 6,145,651 to 13,909,574; and the pigs from 125,541 to 173,168. In Victoria, between 1862 and 1867, the increase had been:—Horses, from 86,067 to 121,381; cattle, from 576,601 to 598,968; sheep, from 6,764,857 to 8,883,139; pigs, from 52,991 to 74,708. In South Australia, between 1863 and 1868, the differences were expressed as follows:—Horses, increase from 56,251 to 74,228; cattle, decrease from 258,342 to 122,200; sheep, increase from 3,431,000 to 4,477,445; and pigs, from 58,850 to 89,304. In Tasmania, during the same period, horses had increased from 21,964 to 23,299, cattle had diminished from 90,446 to 86,598, sheep had fallen off from 1,800,511 to 1,742,914, whilst pigs had increased from 41,986 to 54,287. New Zealand returns, from 1864 to the end of 1867, showed an increase in horse stock from 49,409 to 65,704; in cattle, from 249,760 to 312,829; in sheep, from 4,937,273 to 8,418,579; and in pigs, from 61,276 to 115,090. Queensland, between 1861 and the middle of 1866, had increased her stock of horses from 28,983 to 52,311; of cattle, from 560,196 to 919,414; of sheep, from 4,093,381 to 7,278,778; and of pigs, from 7,465 to 13,529. In general, steady progress is shown in every colony but Tasmania, which has been decidedly retrograding.

Oil Mill in Victoria.—An enterprising Frenchman, M. Jouvet, has made an addition to the manufactures of the colony, by erecting a mill for the manufacture of seed oils. He is well acquainted with the business, having been engaged in it in Europe, and has been led to believe that a seed oil manufactory would prove a profitable investment for capital in this colony by observing how well calculated the soil and climate are for the growth of oleaginous seeds. It might have seemed a more natural arrangement that oil seeds should have been grown before a mill was erected to crush them. But that has not been the order observed in the establishment of this new Victorian industry. The manufactory has had to look to India for its necessary supply of raw material, and the supplies which have been operated upon, up to the present time, have been imported rape and poppy seeds. A large quantity of cotton seeds has been sent from Queensland, and as these are highly oleiferous, the manufacturer hoped to succeed in turning them to account by-and-bye; but, in the meantime, they are so closely enveloped in cotton wool as to be unsuited to the ordinary process of expression. Owing to some defect in the manipulation of the Queensland cotton crop, some of the wool is unnecessarily lost, and the seed rendered unmanageable by the oil maker. As to M. Jouvet's prospects in regard to a local supply of oil seeds there is not much to be said at present. In some parts flax is being grown for its fibre, and no doubt the seed will also be duly cared for, now that a market for it has been created. It also grows to some extent in Tasmania, and negotiations have been commenced that may probably result in the seed produced there finding its way to the Melbourne market.

Sugar Cultivation in New South Wales.—A Sydney paper says:—"A society has been formed at Richmond River to encourage and promote the cultivation of the sugar-cane. A very sensible proposition was made at one of these branch meetings, probably with an eye to the proposals of the Sydney Sugar Refining Company, that the river should be divided into districts, in each of which it shall be stipulated, by the planters resident in it, that a specified number of acres of sugar-cane should be planted this season. The failure of some of the sugar-growing associations in Queensland would not have occurred, if this stipulation had formed part of their programme. A company has been formed at the Clarence, for the purpose of sugar-manufacturing, including, as a matter of course, the purchase of one or two cane crushing-mills. Attention has again been prominently directed to the growth of beet-root, with the view of extracting the saccharine matter, but, as in California, where the thing has been under consideration for the past ten years, the suggestions do not assume a very practicable shape."

Notes.

Aqueducts for the Supply of Paris.—A second enormous reservoir for the supply of Paris with water is now in course of completion at Montrouge; this is to receive the waters of the river Vanne, which will be brought to the capital by means of an aqueduct which will be remarkable not only as a fine specimen of construction and a picturesque object in the landscape, but also in an historical point of view. This aqueduct crosses the picturesque valley of the Bièvre, and is constructed upon the arches of the Aqueduct of Arcueil, originally built to bring the water from Rungis for the gardens and fountains of the Luxembourg. In the time of Henri Quatre, the Minister Sully caused researches to be made to discover whence the Romans obtained water for the Palais des Thermes, the remains of which are annexed to the museum of the Hôtel Cluny, but it was not until the year 1643 that the works were commenced for bringing water from Rungis to Paris; the aqueduct was designed by Jacques Desbrosses—executed by Jean Coing, at a cost of £18,400, and terminated in 1864; it is on the old arches of this aqueduct that those of the new one are being constructed.

Proposed Popular Restaurants in Paris.—The great success of the bouillon establishments, and perhaps also of the great popular restaurant in the grounds of the late Paris Exhibition, has induced some charitable persons to open during the winter months a number of *buffets, réfectoires*, or luncheon houses, in those quarters where large numbers of operatives are employed, and the details are now being carefully studied. It is proposed to limit the articles to be supplied to soup and bouilli, bread, wine, and beer, and to supply the following meal for twenty-five centimes, or two-pence halfpenny:—

	d.
Soup, called *croûte-au-pot*	0½
A slice of boiled beef out of the soup	1
Bread, about 6½ ozs.	0½
A small measure of wine or beer	0½
	2½

Each person on entering will have to pay at the door for what he desires to take, either the whole or part of that above quoted, and will receive a cheque for the amount. Everything is to be consumed on the spot, as the *Fourneaux du Prince Imperial*, like the London soup kitchens, supply all who want it with good soup and bouilli to carry home to their families at extremely low prices. With these two kinds of restaurants in operation the poor of Paris will be fairly assured against privation in bad seasons.

RUSSIAN TELEGRAPHS.—The establishment of electric telegraphs in Russia dates from 1853. The first laid down were from Petersburg to Moscow, Cronstadt, Varsovia, and Kœnisberg. An agreement was made with Prussia for the establishment of the latter line, and with that commenced the international telegraphic correspondence with the other European states. The telegraphic network spread in a short time over all Russia. In the space of thirteeen years the two capitals were placed in communication with the most important and distant towns, and with the bordering states. Laying down the electric telegraph in Russia presents infinitely greater difficulties there than in the rest of Europe, not so much on account of the immense distances as of the climate, smallness of population, variety of governments, high salaries of workmen, and the expense of the transport of materials. In 1865, there were already 61,450 versts of telegraphs, with 323 stations, and 1,644,375 messages were dispatched. What would it have cost formerly, in time and money, to send these messages, not reckoning the wear and tear of horseflesh? To complete the telegraphic network there remains the line which, passing through Siberia, will join America, and which, it is supposed, can be opened in 1870. In the years 1864 and 1865 a telegraphic communication was established with Persia by the Caucasus; the line is continued beyond, towards India. A special agency has been established at Pekin for the sending of Russian-Chinese messages. This agency has the difficulty of overcoming the distrust of the Chinese Government in regard to telegraph communication. Up to the present time this government has telegraphed news to their distant provinces by means of beacon fires. It takes six days for the transmission of news by this means through Tartary. The Russian messages are still even sent to the frontier of Pekin by post.

THE MONT CENIS TUNNEL.—During the first fortnight of the past month (October) the progress made at the Mont Cenis Tunnel was 53·05 metres; of which 23·90 were driven on the Italian side at Bardonnèche, whilst the advancement made on the French side at Modane was 29·15. The position of these works up to the 15th October was as follows:—

	Metres.
Length driven at Bardonnèche	5,235·00
Length driven at Modane..........	3,660·65
Total length of tunnel driven	8,895·65
Length remaining to be driven	3,324·35
Total length of tunnel	12,220·00

Correspondence.

LIQUID FUEL.—SIR,—In the paper which I had the honour of reading before the Society on this subject, last April,* the advantages of the material known as "creasote," or "dead oil," obtained in rectifying coal-gas tar, were briefly referred to, and its superiority to petroleum or shale oil pointed out; but the extent to which this material is capable of producing heat when burnt, and of generating steam, was not gone into. Since that time, however, the use of this material appears to have chiefly attracted attention in the various attempts to apply liquid fuel, and therefore it becomes a question of especial interest to consider what may be its capabilities as fuel compared with coal and with various kinds of petroleum and shale oil. For this reason I have computed the evaporative power and evaporative duty corresponding to the composition of this material on the same general principle which was applied in the case of petroleum and its more closely related analogies, and I shall feel glad if you think the subject of sufficient interest to afford the results a place in your *Journal*. Although the term "creasote" is frequently applied to the material now referred to, it consists only in part of the substance known to chemists as creasote, or to the extent of about 20 to 30 per cent. of its bulk. The remaining portion consists chiefly of a mixture of napthalin, anthracene, and liquid hydrocarbons, known by the names xylol, cumol, and cymol. The crude creasote itself consists of two substances, known by the names phenol and cressol. The composition of these substances respectively is as follows:—

	Carbon.		Hydrogen.		Oxygen.
Phenol ..	76·60	....	6·40	....	17·00
Cressol ..	77·70	....	7·41	....	14·82
Napthalin	95·75	....	6·25	....	—
Anthracene	94·38	....	5·62	....	—
Xylol	90·56	....	9·44	....	—
Cumol ..	90·00	....	10·00	....	—
Cymol....	89·55	....	10·45	....	—

According to these data, and on the assumption that the combustible carbon and hydrogen contained in these substances will generate—when burnt with just sufficient air for perfect combustion—quantities of heat capable of converting respectively 11·359 lbs. and 41·895 lbs. of water at 60° Fahr. into steam at 212° Fahr. for each pound of carbon or hydrogen burnt, the theoretical evaporative power of these substances, and the evaporative duty they are capable of effecting when the furnace gas is discharged at 600° Fahr. above the temperature of the air supplied to the furnace, will be as follows for each pound of substance burnt:—

	Evaporative power.	Evaporative duty.
	lbs. of water at 212° F.	lbs. of water at 60°F.
Phenol	12·2437	10·5025
Cressol	13·0096	11·1632
Anthracene	15·2417	13·0751
Napthalin	15·4635	13·2675
Xylol	16·5866	14·2415
Cumol	16·7838	14·4126
Cymol	16·9422	14·5500

Dead oil may possibly contain some other substances richer in hydrogen than any of those above named, and in such case the oil would have a proportionately greater evaporative power; but these substances may be fairly taken as representing the composition of dead oil; and as their evaporative power varies from 12·24 to 16·94, while the corresponding evaporative duty varies from 10·5 to 14·5, the mean values being 15·18 and 13·03, the evaporative duty of which dead oil is capable will average about 13lbs. of water, heated from 60°, and converted into steam at 212° F., and it will vary more or less in this respect according to the relative proportion of the substances it may happen to contain. At the same time it will be seen that 14lbs. of water heated from 60°, and evaporated at 212°, is the maximum that could be expected in any case. In order to complete the comparison between this material and coal as fuel for steam vessels, if the average duty realised with coal on board ship be taken as equal to 7lbs. of water heated from 60° and evaporated at 212° F., the maximum efficacy of dead oil might be about 100 per cent. greater than that of coal, as now ordinarily used. Consequently the weight of oil required to fuel a vessel would be only half that of the coal required. Then, taking the ton of coal as stowed on board ship to occupy 43 cubic feet, and the ton of dead oil as occupying 34 cubic feet, a quantity of oil equivalent to one ton of coal would occupy only 17 cubic feet. Therefore the use of this oil as fuel would be attended with a saving of one-half the weight of coal to be carried, and to about 60 per cent. of the stowage space required for coal. These results fall very far short of some of the results reported to have been obtained in practice; but as we are still without any satisfactory evidence that these practical results are to be depended upon, notwithstanding the great length of time which has elapsed since I first pointed out this deficiency, and although the use of liquid fuel is advertised as having been adopted by her Majesty's Government,* it appears to me that we must, for the present at least, adhere to that method of estimating the relative efficacy of fuel which has hitherto been customary, and take the results which it furnishes as above stated to represent the facts of the case pretty nearly.—I am, &c., Benjamin H. Paul.

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* *Journal of the Society of Arts*, vol. xvi., p. 404.

MEETINGS FOR THE ENSUING WEEK.

Mon......Royal Geographical, 8½. 1. Opening Address of the President. 2. M. Severtsof, "Exploration of the Thian Shan Mountains." 3. Major-Gen. Sir H. C. Rawlinson, K.C.B., "Routes between Eastern Turkestan and N.W. India."

Tues ...Ethnological, 8. 1. Dr. Blanc, "On the Abyssinians." 2. Mr. R. A. Cole, "On the Discovery of Cromlechs in India." 3. Lieut. Steel, "On the Khasia Tribes."

Thur ...Zoological, 8½. 1. Letters from Sir Rutherford Alcock, Mr. Swinhoe, and other correspondents. 2. Report by the Secretary on recent additions to the Society's Menagerie. 3. Mr. Robert Brown, "Notes on the History and Geographical Relations of the *Cetacea* frequenting Davis Strait and Baffin's Bay."

Patents.

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From Commissioners of Patents' Journal, October 30.

Grants of Provisional Protection.

Augers, boring bits, &c.—3191—C. Whitehouse.
Boats, propelling on canals, &c.—3100—E. Evans.
Boilers—3084—J. Arnold.
Boots, &c., soles of—3090—M. P. Manfield.
Bottles, treating, to prepare them to receive beer, &c.—3103—W. T. Read.
Bottles, &c., packing—1985—J. Perry.
Buildings, constructing—3162—I. A. Vacherot.
Buttons, &c.—3092—A. MacMillan.
Carts, dust and water—3195—J. Rae.
Casks, &c., bung bushes for—3110—G. P. Grant.
Cisterns, &c., cast-iron—3105—J. C. Morgan, H. Macaulay, and F. W. Waide.
Cocks, taps, &c.—3116—W. H. S. Aubin and B. Benton.
Drags for the wheels of vehicles—3179—D. Wilson.
Fire-arms, breech-loading—2942—C. E. Brooman.
Fire-arms, revolving and repeating—3131—F. A. Le Mat.
Furnaces, burning combustible liquids in—3183—H. Bunning, jun.
Furniture, &c., extending frames for—3088—F. Zysel.
Gaseliers, &c., holders for glass and other globes or shades for—3209—D. and A. Posener and M. Unger.
Glass, &c., polishing—2880—E. T. Hughes.
Iron and steel—3108—J. Griffiths.
Lace—3161—J. and A. Ball.
Lattices, travelling, for conveying fibrous materials into or out of machines—3147—E. Leach.
Lead pencil and eraser combined—3077—F. Ayckbourn.
Locks and latches—3153—C. G. Gumpel.
Looking-glasses, &c.—3193—W. H. Howes.
Looms—3076—T. Sagar and T. Richmond.
Looms—3082—W. Bland.
Looms—3187—T. Wrigley.
Mattresses, spring—3159—E. Peyton.
Mines, &c., sinking shafts for—3072—J. Chaudron.
Motive-power engines—3197—W. Gore and J. Thornhill.
Motive-power, obtaining by means of the wind—3014—J. Olivier.
Mules for spinning and doubling—3199—J. Elce.
Ores and minerals, calcining—2950—R. Oxland and J. Hocking, jun.
Ores, minerals, &c., calcining—3112—T. Merz and G. Thomson.
Ores, &c., washing—3181—W. T. Rickard and W. C. Paul.
Paving—3111—F. Barnett.
Poison bottles, &c., label attachments for—3096—W. Jarvis.
Printed works, preparing the folded paper sheets used for—3185—R. A. Green.
Pumps—3094—H. A. Bonneville.
Railway breaks—3201—G. Voigt.
Railway trains, apparatus for communicating between the passengers, guards, and drivers of—3127—J. Ward.
Scarves, &c., fastening—3157—G. C. Attree and T. Dermer.
Scissors—3189—B. Hunt.
Screws, cutting—2004—S. Bowen, C. Glover, R. H. Davis, T. Standford, T. Scott, A. M. Bell, E. Sheldon, W. Farmer, L. Maskall, E. Colburn, and J. C. Cole.
Sewage, treating—3203—G. Chapman.
Ships of war, constructing—2452—T. R. Oswald.
Silver and gold, separation of copper, &c., from—3167—R. Pearce.
Syrup and sugar—3171—W. E. Newton.
Tobacco pipes—3207—J. Lorkin.
Tobacco pipes, &c., manufacturing—2910—W. H. J. Grout.
Vegetable, animal, or mineral substances, apparatus for washing, dyeing, cooking, &c.—3104—S. Tragheim.
Wearing apparel, fastening for—3114—S. J. Maccarthy.

Inventions with Complete Specifications Filed.

Carriage wheels—3227—W. K. Foster.
Refrigerators—3278—W. Mort.
Steel, converting cast-iron into—3237—A. B. Bérard.
Water craft, propelling—3233—G. T. Bousfield.

Patents Sealed.

1152. J. Dunbar & R. Nicholson.
1383. J. and M. Pearson.
1384. G. T. Bousfield.
1385. G. A. Cox.
1388. A. Dietz.
1389. H. Waugh.
1392. J. Bottomley.
1394. S. Robotham.
1396. T. and G. Cope.
1397. W. Wright.
1399. C. D. Fox.
1401. J. J. Long.
1404. R. Scott.
1409. J. Gough.
1410. W. Ferrie.
1411. J. Dendy and J. R. Beard.
1412. J. Betteley.
1416. S. Parr and A. Strong.
1418. B. F. Weatherdon.
1421. T. Beeley.
1423. J. Lillie.
1426. A. Munro.
1427. A. B. Childs.
1428. J. Warne.
1429. W. E. Everitt.
1431. J. H. Johnson.
1432. J. Heaton.
1433. F. Barnett.
1440. J. Maistre.
1441. A. Smith.
1442. J. E. Boyce & R. Harrington.
1443. J. H. Johnson.
1444. W. R. Lake.
1446. W. R. Lake.
1451. I. M theï.
1490. S. Holt and J. Kearsley.
1491. J. G. Walker and C. Stein.
1492. J. G. Walker.
1508. J. Bruce and R. Evans.
1514. A. James.
1516. J. A. Jones.
1520. W. E. Everitt.
1554. H. B. Barlow.
1566. W. E. Newton.
1580. W. E. Newton.
1581. W. E. Newton.
1584. N. Basevi.
1591. J. H. Johnson.
1598. A. V. Newton.
1603. J. Price.
1608. A. J. Murray.
1614. A. Parkes.
1701. W. Seck.
1741. F. Wirth.
1954. W. C. and R. G. Sillar and G. W. Wigner.
1955. L. B. Prindle.
2023. A. V. Newton.
2048. H. Highton.
2189. J. Jefferys.
2264. J. Gill.
2440. H. A. Bonneville.
2567. J. H. Johnson.

From Commissioners of Patents' Journal, November 3.

Patents Sealed.

1449. W. E. Gedge.
1455. E. and G. H. Morgan.
1456. W. Marshall.
1457. W. Estor and M. Terrero.
1459. D. P. Wright.
1466. J. Clough.
1469. G. Kent.
1470. D. R. Macgregor and P. Taysen.
1471. W. Beale.
1473. F. J. King.
1479. R. Lublinski.
1480. T. Warren.
1487. F. T. Hall.
1489. M. Henry.
1493. W. Harvie.
1495. M. A. Muir & J. McIlwham.
1496. H. A. Bonneville.
1497. B. Pickering.
1499. A. C. Henderson.
1500. A. C. Henderson.
1504. J. H. Johnson.
1510. G. Bowden and J. R. Dickinson.
1524. A. M. Clark.
1527. G. T. Seydel.
1529. J. H. W. Biggs.
1533. A. D. E. Boucher.
1534. A. D. E. Boucher.
1564. C. Iles.
1569. W. Tasker, jun.
1575. T. B. Kay.
1638. J. Pollock.
1686. C. Fusnot.
1689. W. E. Newton.
1692. J. Oury.
1724. J. Adams.
1732. W. E. Newton.
1808. W. E. Newton.
1809. W. E. Newton.
1814. R. Soans.
1816. J. H. Johnson.
1930. C. Rostaing and E. Vivet.
2050. J. Hine.
2145. G. Davies.
2148. G. Davies.
2313. W. Gilbert.
2321. J. Kilner.
2323. A. Bochkoltz.
2329. G. A. Thibierge.
2417. J. Heaton.
2418. J. Heaton.
2620. H. Thompson.

Patents on which the Stamp Duty of £50 has been paid.

2760. J. Johnson.
2839. R. Smith, jun.
2898. E. J. Davis.
2789. W. Whittle.
2795. W. Deakin and J. B. Johnson.
2806. M. Bayliss.
2826. E. Rushton.

Patents on which the Stamp Duty of £100 has been Paid.

2745. M. & M. Myers & W. Hill.
2900. G. Parry.

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* *Journal of the Royal United Service Institution*, Vol. ix., p. 79-82.